

Water Treatment: What Is It and Why Should I Care



BARCLAY

BETTER WORKING WATER™



What is Water Treatment

- According to ASHRE and the E-ZINE ***Mechanical Matters®***
 - **Water treatment** describes a process used to make water more acceptable for a desired end-use. In the mechanical industry water treatment is a method used to optimize most water-based mechanical and industrial processes, such as: heating, cooling, processing, cleaning, and rinsing, so that operating costs and risks are reduced.

Steam Cycle

Water Treatment Goals

- Prevent Boiler, Feedwater and Condensate System Deposition
- Prevent Boiler, Feedwater and Condensate System Corrosion
- Maintain Steam Purity
- Prevent pH Depression and Associated Corrosion
- Prevent / Minimize Flow Assisted Corrosion

Cooling System Water Treatment Goals

- Prevent System Deposition
- Prevent System Corrosion
- Maintain Maximum Heat Transfer
- Prevent Biological Fouling / Attack
 - Legionella

COLLECTION OF SCALE PLUGGING BOILER TUBES



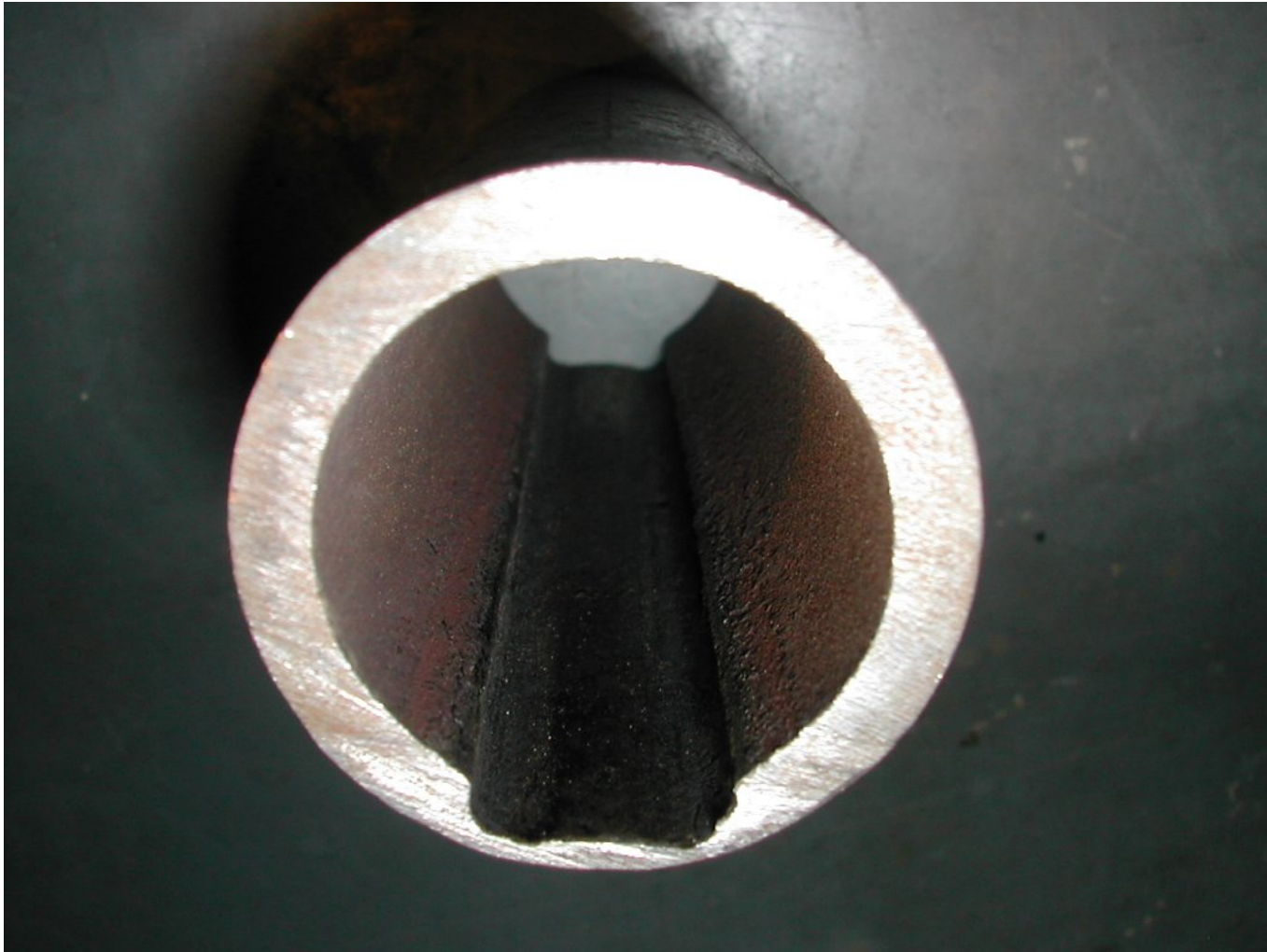
SEVERE BOILER SCALE ACCUMULATION



OXYGEN PITTING BOILER TUBE – FEEDWATER LINE



GROOVING ATTACK CONDENSATE RETURN LINE



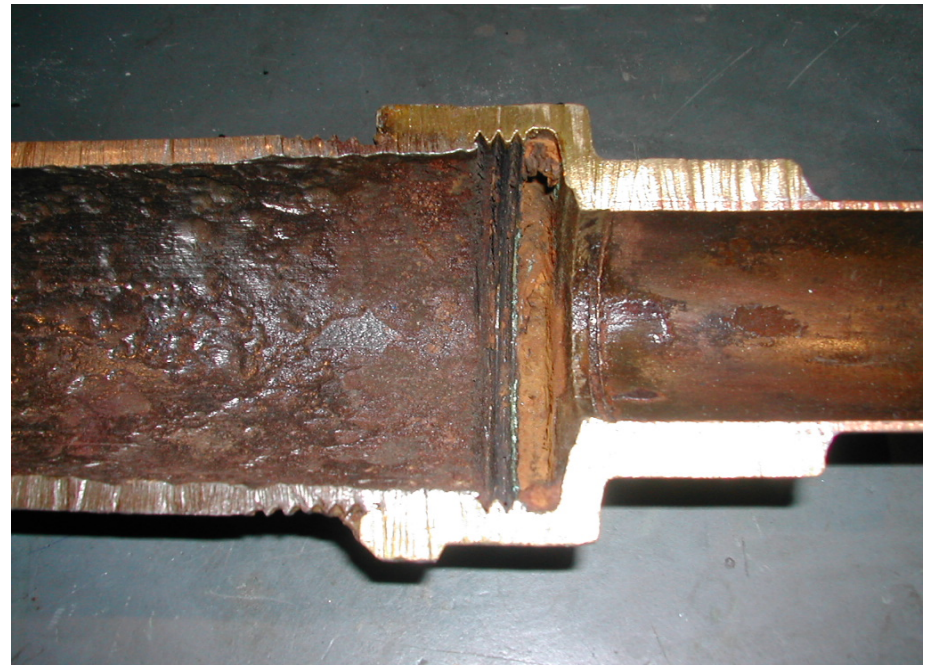
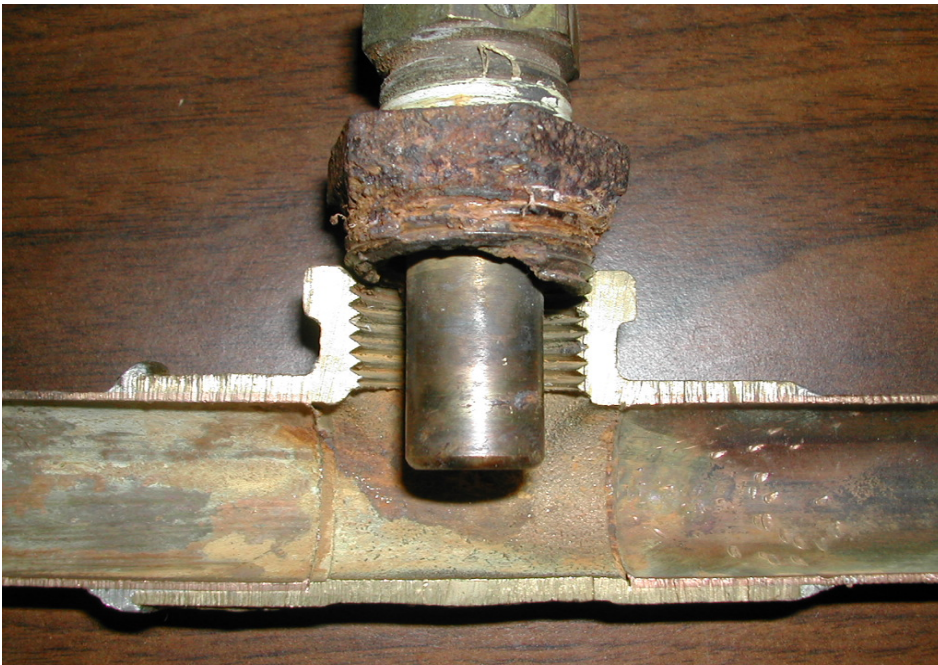
CARBONIC ACID ATTACK CONDENSATE RETURN LINE



**OXYGEN PTTING
CONDENSATE RETURN LINE**



GALVANIC CORROSION



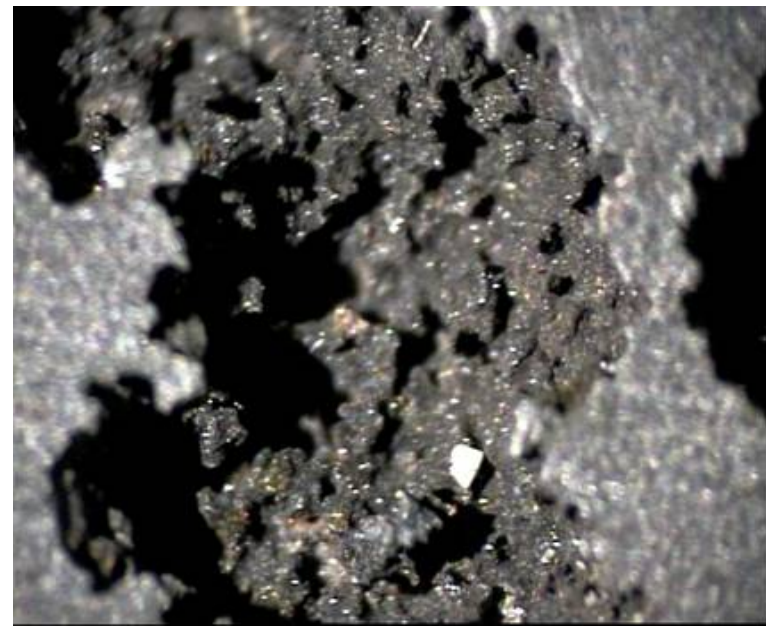
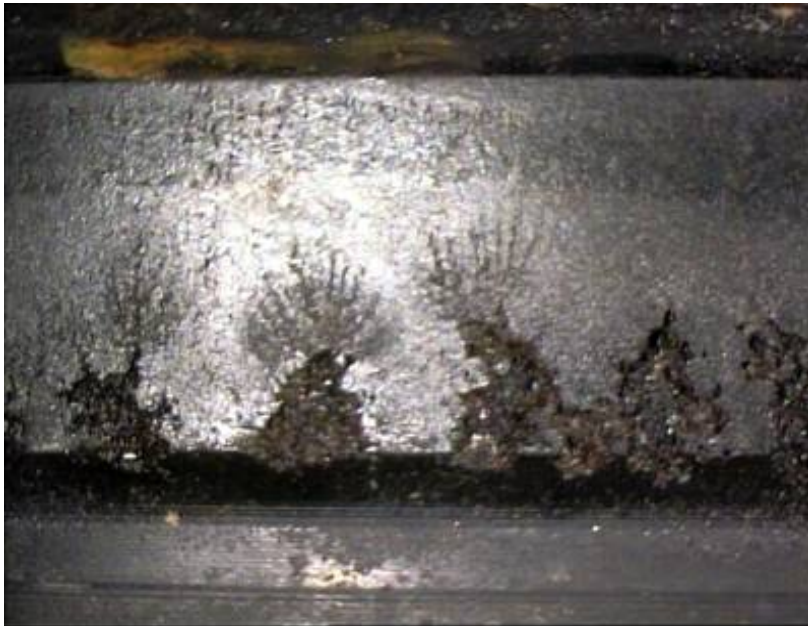
Mic



De-Zincification of a Brass Water Meter With The Accumulation Of White Zinc Oxide On The Water-side Surfaces Example Of Dealloying Corrosion



Impingement Attack / Cavitation



Stress Corrosion Cracking

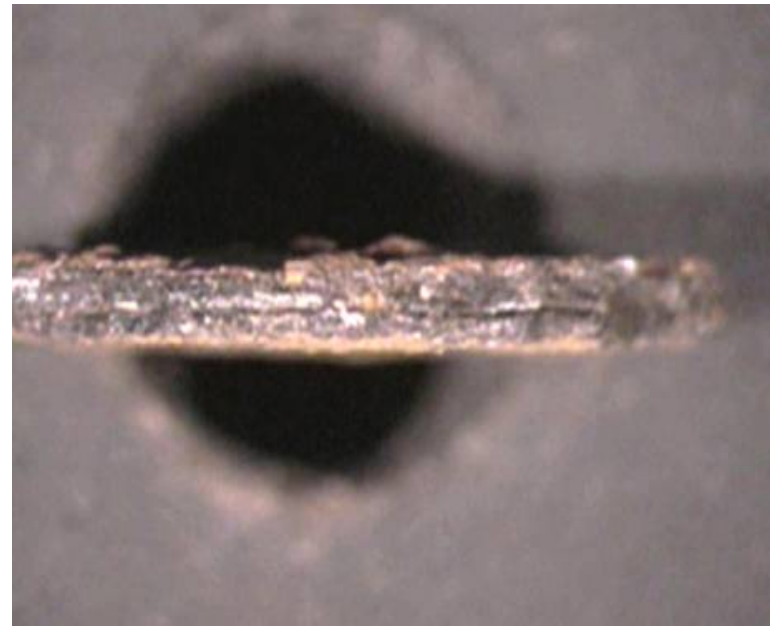


Copper/Nickel Tube
At Tube Sheet



Stainless Steel In
High Chloride Use

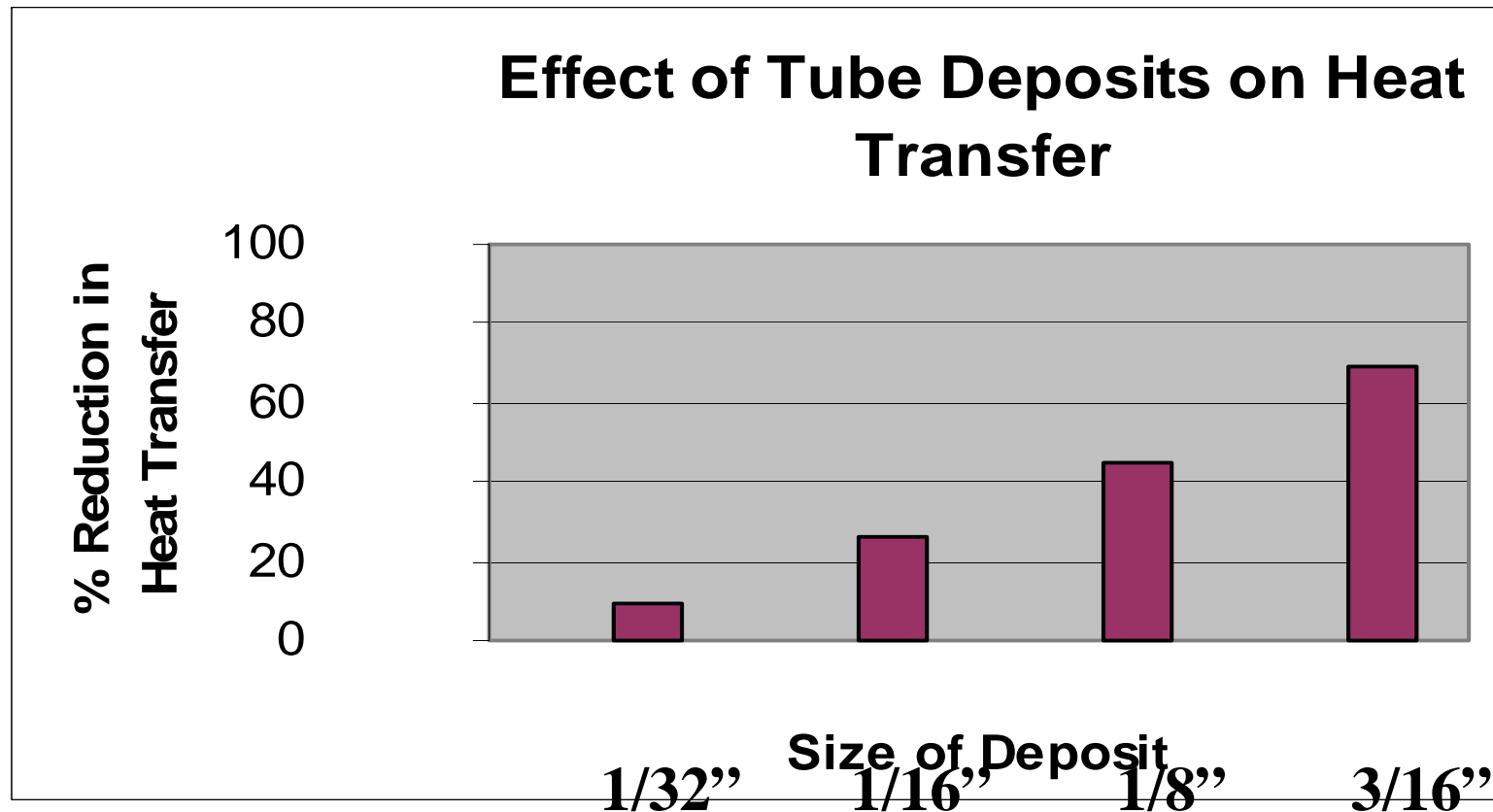
Exfoliation / Chip Scale



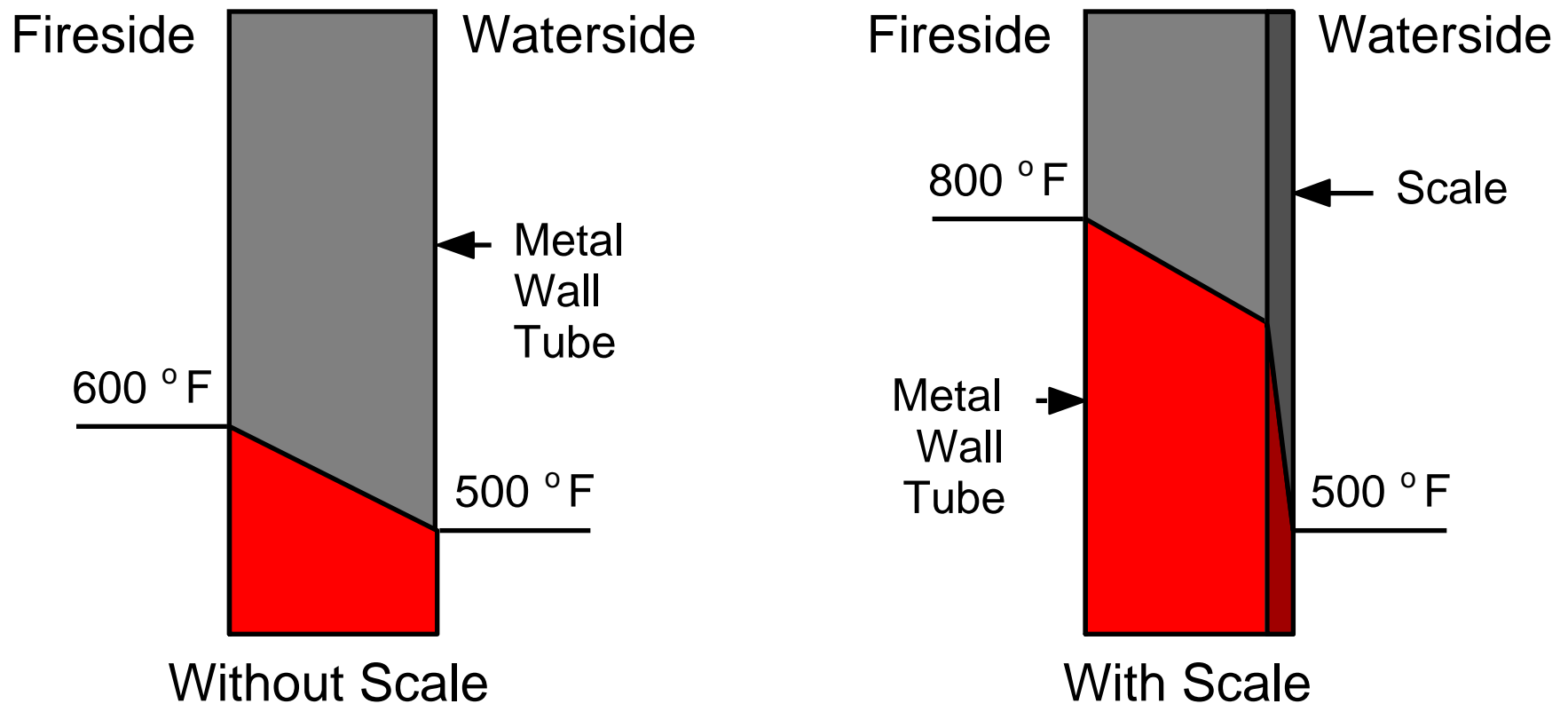
Insurance Industry Reports

- 44% of all boiler failures are Water Treatment Related
 - 36% Due to Scale and Sediment
 - 8% Due to corrosion and erosion
- 32% of all cooling system failures are Water Treatment Related
 - 20% Due to Scale and Sediment
 - 12% Due to corrosion and erosion

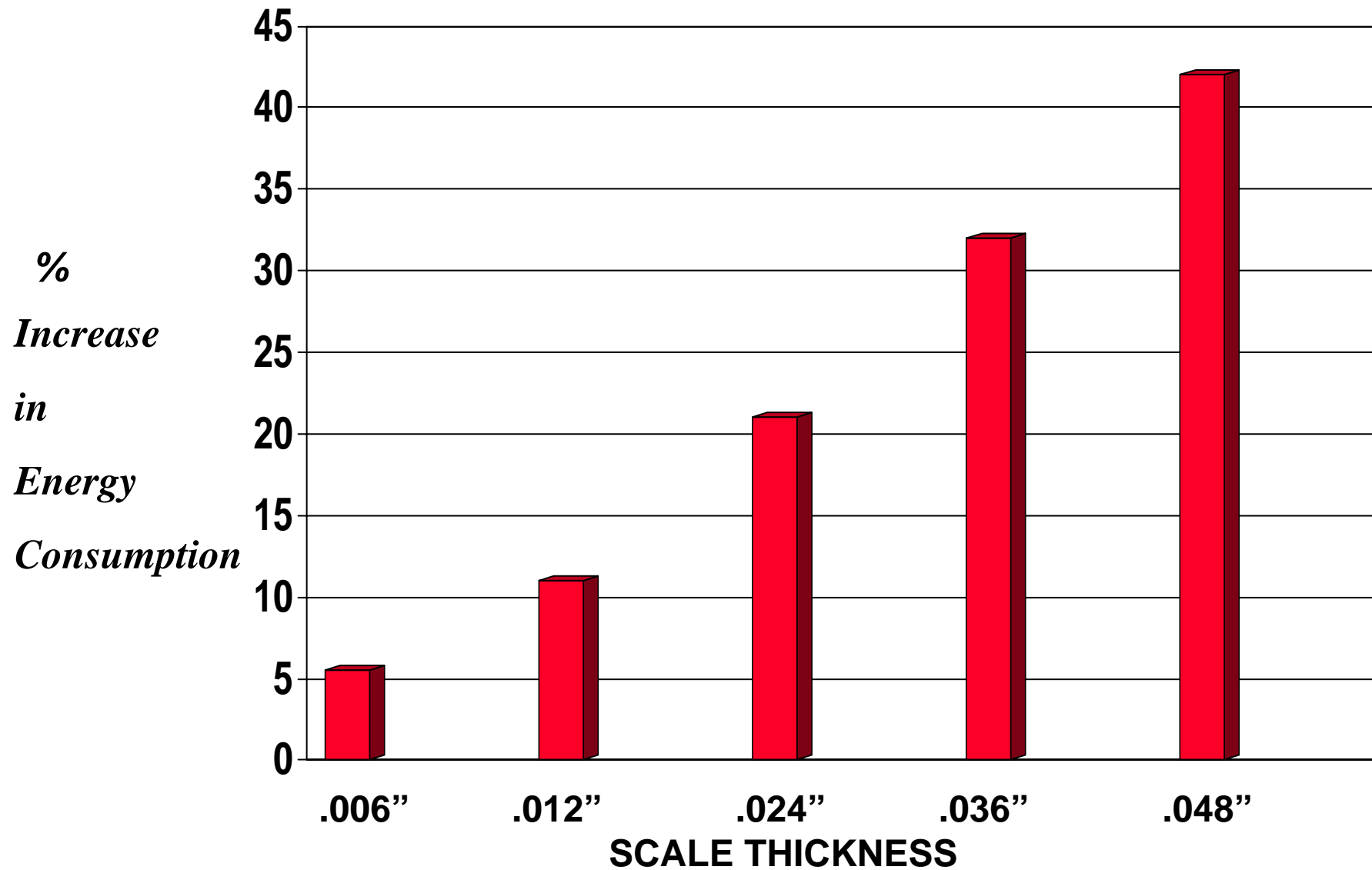
The Cost Goes Beyond System Integrity



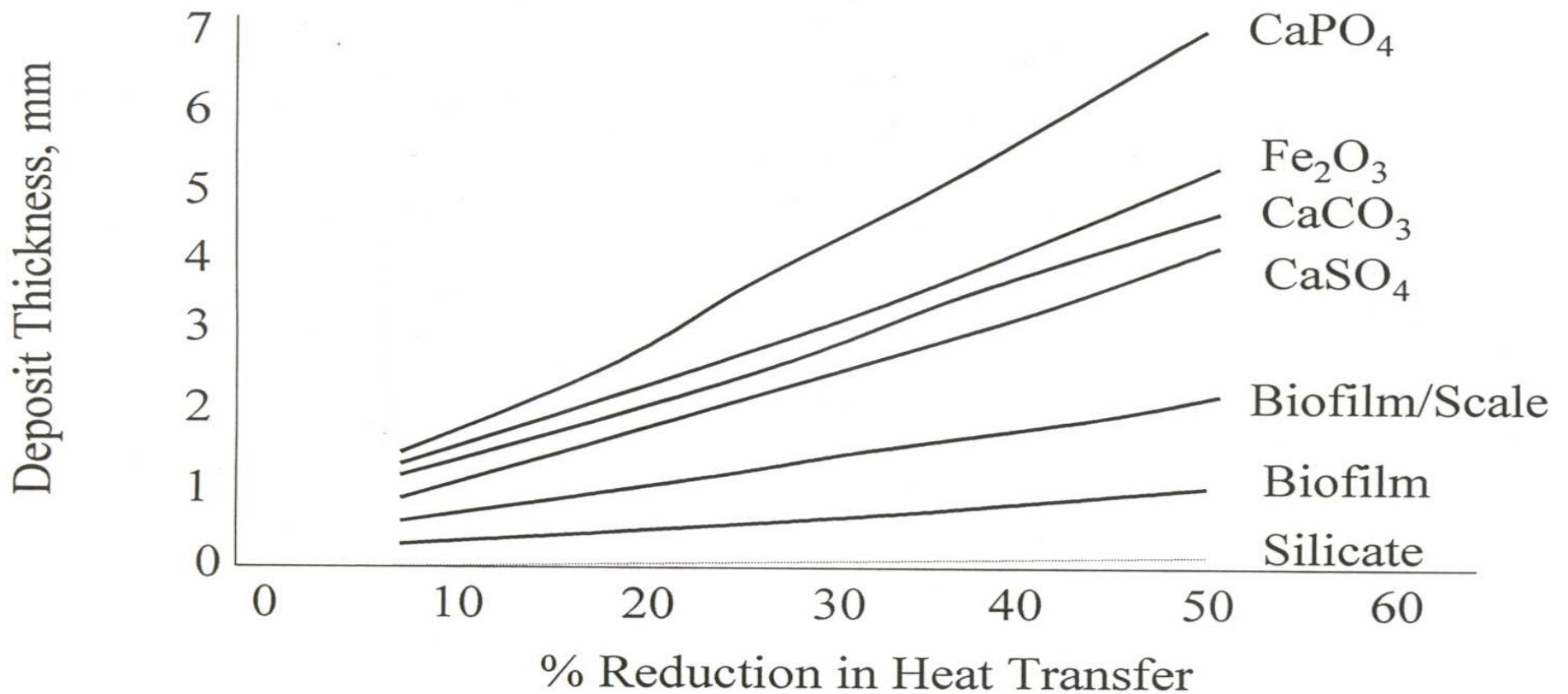
BOILER DESIGN



Effect of Hardness Scale on Energy Costs



Impact of Scale & Fouling On Heat Transfer Ranking of Common Foulants



Examples of Water Treatment ROI (Return on Investment)

- **Scale**

System: 1,000 ton chiller

Operation: 12 hours/day, 365 days/year

Cost of electricity: \$0.10/kWh

Scale thickness: 1/32 inch

**Elimination of 1/32 inch of scale
saved \$15,018 per year.**

Examples of Water Treatment ROI (Return on Investment)

Biological Fouling

System: 1,000 ton chiller

Operation: 12 hours/day, 365 days/year

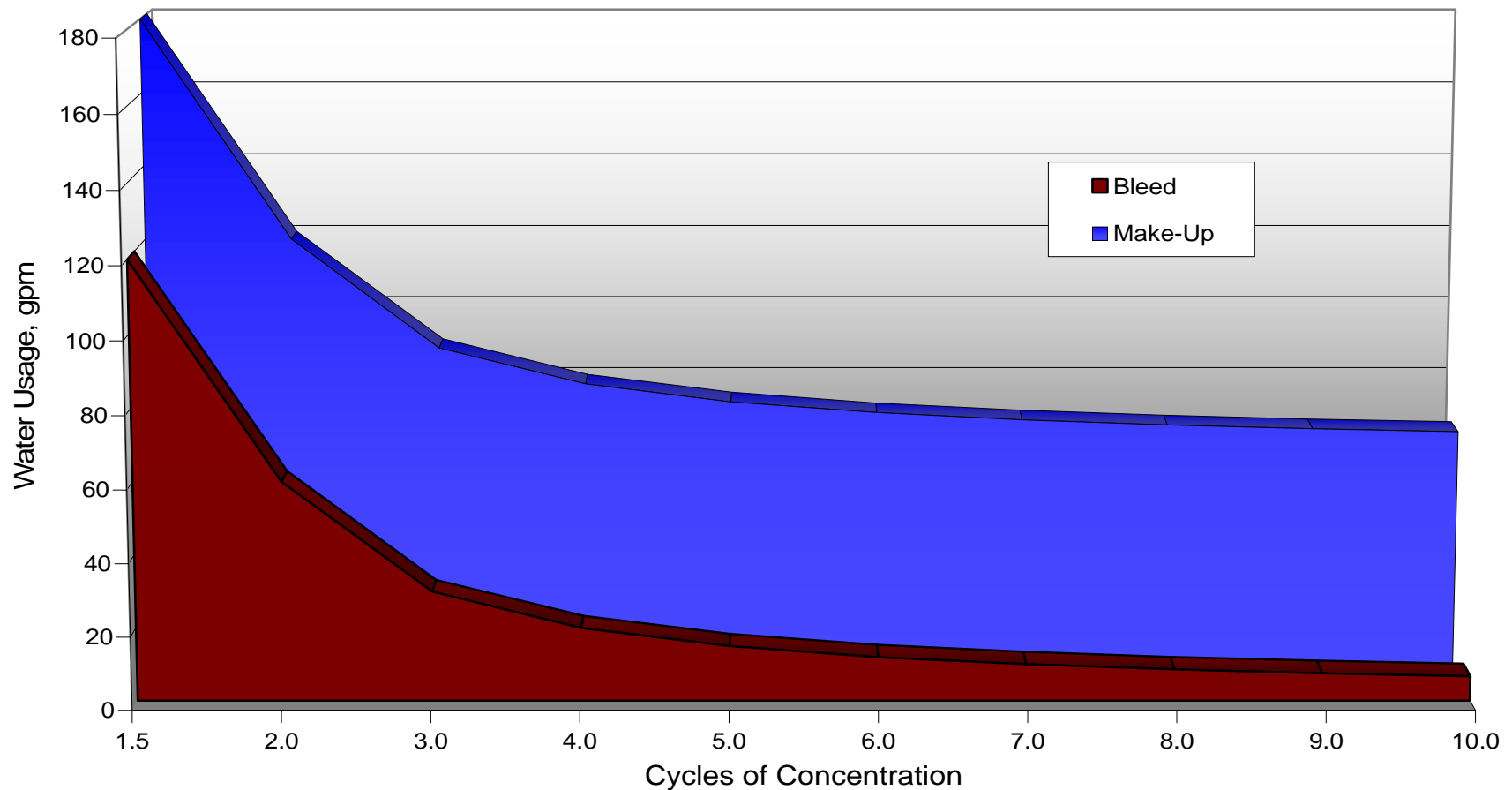
Cost of electricity: \$0.10/kWh

Bio-film thickness: 1/1000 inch

**Elimination of 1/1000 inch of
biofilm saved \$26,834 per year.**

The Impact goes beyond Energy

Effects of Cycles on Make-up & Bleed



Save Money by Saving Water and BTUs

Example: Proper water treatment lets you reduce blowdown from 8% to 6%.

- This example assumes a continuously operating natural-gas-fired, 150-psig, 100,000-pound-per-hour steam boiler with a makeup water temperature of 60°F, boiler efficiency of 82%, fuel cost of \$3.00 per million Btu and a total water / sewage cost of \$0.004 per gallon.

- Annual cost savings =

100,000 Boiler Feedwater: = 108,695 lbs/hr(1 - 0.08) 100,000 Final –
106,383 lbs/hr(1 - 0.06) Makeup Water Savings =

108,695 – 106,383 = 2312 lbs/hr

Enthalpy of boiler water = 338.5 Btu/lb

Enthalpy of makeup water at 60°F = 28 Btu/lb

Thermal Energy Savings = 338.5 – 28 = 310.5 Btu/lb

Annual Fuel Savings = 2312 lbs/hr x 8760 hrs/yr x 310.5 Btu/lb x \$3.00/MBtu x .82 =
\$23,007 per year

Save Money by Saving Water and BTUs

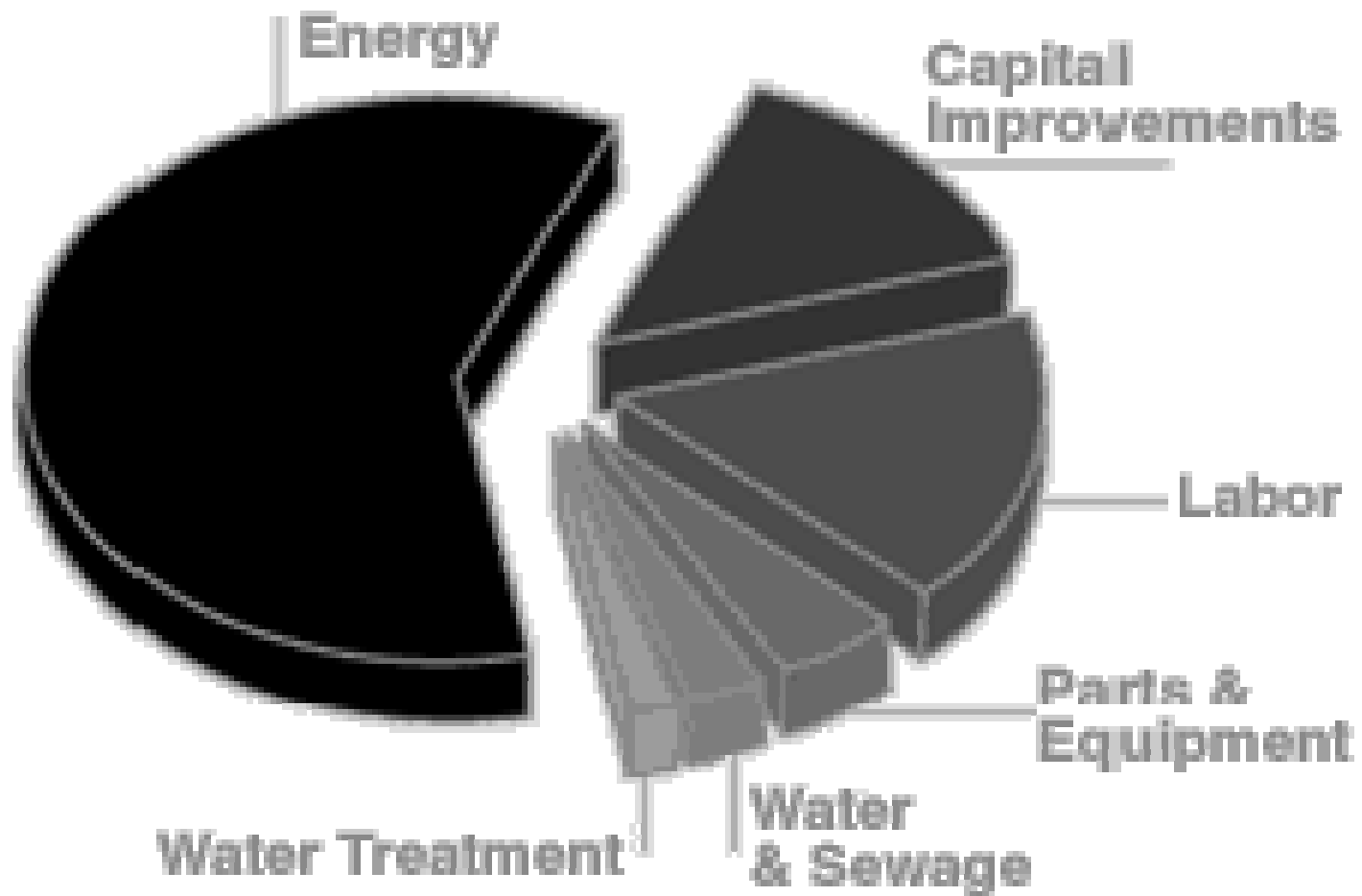
Annual Water and Sewer Savings =

$$2312 \text{ lbs/hr} \times 8760 \text{ hrs/yr} \times \$0.004/\text{gal} / 8.34 \text{ lbs/gal} = \text{\$9,714}$$

Overall Annual Savings =

$$\text{\$23,007} + \text{\$9,714} = \text{\$32,721}$$

Typical Facility Budget Percentages.



Quotes For Facility Managers Around the Globe

- *It's a sliver of your overall facilities budget, but effective water treatment can make an enormous difference in your other costs.*
 - Warren Scott, supervisor of mechanical systems at the Massachusetts Institute of Technology (MIT) (Facilities.net)

Quotes For Facility Managers Around the Globe

- **Improper Water Treatment** or no treatment at all will increase your energy consumption and operating cost while decreasing your mechanical equipment's efficiencies and life expectancy. A well designed and implemented water treatment program is highly important to the operation of any steam boiler, centrifugal chiller and cooling tower.
 - Jimmy Veteto, ***Mechanical Matters®***

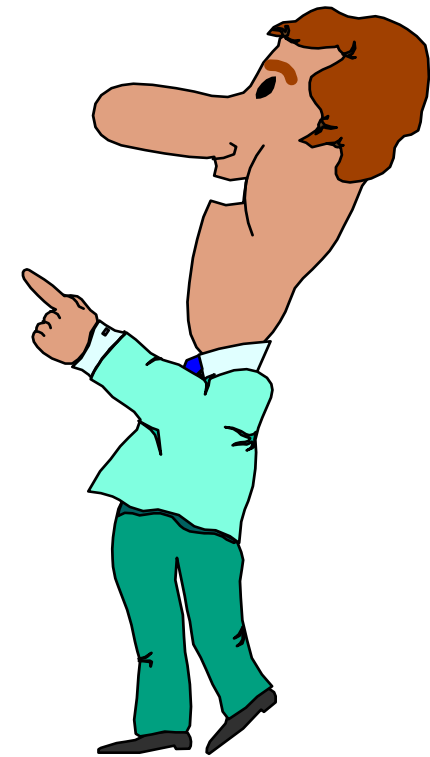
Quotes For Facility Managers Around the Globe

- By improving and monitoring the quality of your feedwater—and by increasing your boiler cycles—a sound water treatment program can go a long way toward reducing operating costs and increasing plant profitability.
 - Jim Matthews, Duke Facilities Management

Quotes For Facility Managers Around the Globe

- Water treatment can often be categorized as 'low-tech' and unglamorous. However, the right chemicals, proper chemical feed equipment, and a dedicated service provider is essential to your mechanical equipment and should be 'treated' with top priority.
– Tom Moore, GE O&M

**ARE THERE ANY
QUESTIONS?**





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